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COMMENTS

Comment: Snorkeling As an Alternative to Depletion Electrofishing for Estimating Abundance and Length-Class Frequencies of Trout in Small Streams

Mullner et al. (1998) regressed trout counts determined by snorkeling against estimates determined by electrofishing in small streams in Wyoming and demonstrated that snorkel counts of trout could be used to predict depletion estimates of abundance obtained by electrofishing in small mountain streams. The 95% confidence bounds they show for these regressions, however, are misleading to the reader.

The regression line shown is an estimate of the mean electrofishing depletion estimates expected for given snorkel counts. Similarly, the 95% confidence limits shown are the range of estimates for this mean. In other words, if one were to conduct many additional snorkel counts and electrofishing estimates and find another set of reaches where the snorkel counts all happened to be 31 trout, the mean electrofishing depletion estimate of these reaches is predicted to be 56 trout, and there is a 95% probability that the ''true'' mean (assuming that a ''true'' linear relationship exists between these two variables) would lie between 42 and 70 fish.

However, this is not how biologists would typically use such a regression. Once a model is developed between snorkeling counts and electrofishing depletion estimates, new snorkeling counts (independent of the data on which the regression analysis was based) would be applied to the model to predict depletion estimates of abundance, and 95% prediction limits (Neter et al. 1989) would be estimated for each new prediction. For example, if one were to snorkel an additional stream and count 31 trout, the model would still predict a depletion estimate of 56 trout, but the expected range of the corresponding single electrofishing estimate would lie between −11 (zero, in practical terms) and 124 fish, with 95% probability. Prediction intervals are more appropriate to present with regression relationships that are meant to be used in a predictive manner. Using data from Table 1 in Mullner et al. (1998), we replotted their Figure

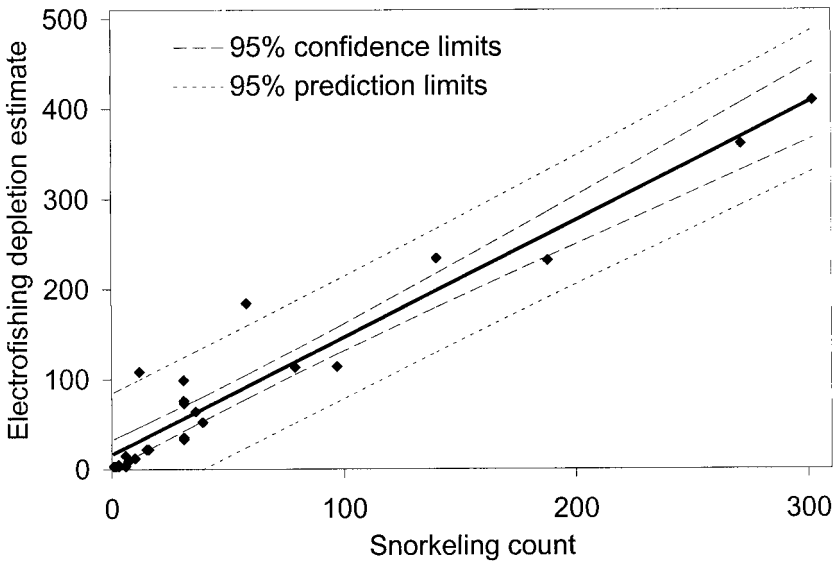

Figure 1.—Depletion electrofishing estimates versus snorkeling counts (solid line), 95% confidence limits (long-dashed lines) presented by Mullner et al. (1998), and 95% prediction limits (short-dashed lines).

1a with their original confidence interval and plotted the prediction interval (Figure 1).

We believe the method presented by Mullner et al. (1998) is useful when inventorying salmonid populations in small streams, especially in basinwide assessments. However, we caution the reader that the confidence bounds they can expect to achieve when predicting fish abundance from snorkeling count–electrofishing estimate regressions will be much wider than the figures in Mullner et al. (1998) would lead the reader to believe.

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References

Mullner, S. A., W. A. Hubert, and T. A. Wesche. 1998. Snorkeling as an alternative to depletion electrofishing for estimating abundance and length-class frequencies of trout in small streams. North American Journal of Fisheries Management 18:947–953.

Neter, J. W. Wasserman, and M. H. Kutner. 1989. Applied linear regression models, second edition. Irwin, Homewood, Illinois.

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Snorkeling As an Alternative to Depletion Electrofishing for Estimating Abundance and Length-Class Frequencies of Trout in Small Streams: Response to Comment

The comment by Bakke and Meyer is very pertinent. The extent of error associated with regression equations should be clearly identified in research publications. The standard presentation of r^2, P, and confidence intervals (CI) does not fully reflect the accuracy of individual predictions; however, inclusion of data sets allow calculation of prediction intervals (PI) by others. This is demonstrated by the ability of Bakke and Meyer to duplicate our regression with associated CI and PI values. More emphasis should be placed in education, research, and management on the potential errors associated with estimates.

It is also important to recognize that there is error associated with the direct estimate of the dependent variable, abundance by depletion electrofishing. Among the reaches in our data set where 184–234 trout were estimated to occur using depletion electrofishing, the 95% CIs of these estimates ranged from ±13 to ±18 fish. The 95% CIs of individual snorkeling estimates were similar at ±18 to ±22 fish for the corresponding depletion electrofishing estimates.

To overcome errors associated with individual estimates of fish abundance whether they be associated with snorkeling or depletion electrofishing estimates, large numbers of individual estimates within a study area are needed (Scheaffer et al. 1996). In streams where snorkeling is possible, a large number of estimates can be made in a relatively short time, at a much lower cost and with less injury to fish than is possible using depletion electrofishing.

When possible, use of snorkeling should allow managers to substantially increase the number of reaches sampled to yield population estimates for a stream or watershed having better precision than can be obtained with a small number of depletion electrofishing estimates.

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References

Mullner, S.A., W.A. Hubert, and T.A. Wesche. 1998. Snorkeling as an alternative to depletion electrofishing for estimating abundance and length-class frequencies of trout in small streams. North American Journal of Fisheries Management 18:947–953.

Scheaffer, R. L., W. Mendenhall III, and R. L. Ott. 1996. Elementary survey sampling. Fifth edition. Wadsworth, Belmont, California.